

The period of Darwinism  
(1859-1882)

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### Exercise 1 (home group, individual work):

Read the following text carefully. Your task is to fill in the missing words and phrases, which you know from your biology lessons. If you need help, you can...

- ...go back in the text or
- ...read further.

If you have problems understanding the text, write down your questions!

**Charles Darwin** was an enthusiastic natural scientist. He tried to write down all his observations of animals and plants and sought to explain them. After his expedition on the Beagle (fig. 1), which took five years, Charles Darwin recognized that there had to be an explanation other than creation by God for the diversity of life and for the similarities he observed between the organisms.

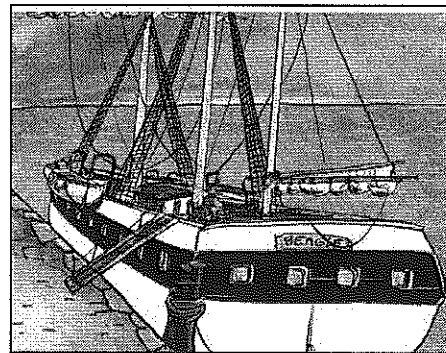


Fig. 1: The research ship: the Beagle.  
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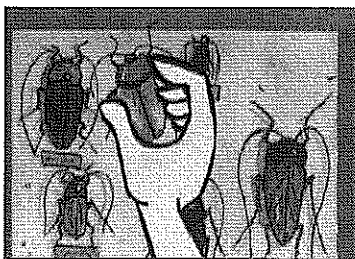


Fig. 2: Darwin collected animals.  
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In 1837 Darwin wrote down the theory of descent with \_\_\_\_\_ for the first time in his notebooks. The name of the theory derives from the Latin *descendere* (i.e. to descend) and means that organisms descended from a common ancestor and changed. Darwin developed this theory by collecting fossils and animals. He noticed that he could reproduce

lines of related organisms by arranging them in such a way that there were very few modifications from one organism to the next.

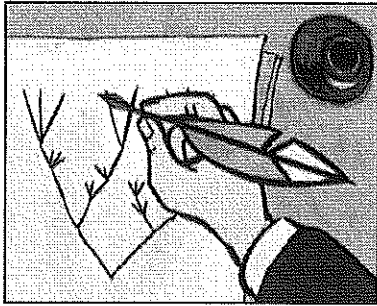


Fig. 3: Darwin draws a phylogenetic tree. © CNDP, 2009

In the same year, Darwin described the theory of \_\_\_\_\_ of all organisms. Later he also included human beings – to the horror of many. However, **Darwin** initially wrote down this idea only in his notebooks. It was essential for him that all organisms on earth have a common origin.

In 1838, **Darwin** explained the change of the species by means of the theory of \_\_\_\_\_. He was inspired to do so, when he read a book from Thomas R. Malthus about human population:

*"[F]ifteen months after I had begun my systematic enquiry, I happened to read for amusement Malthus on Population, and being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observation of the habits of animals and plants, it at once struck me that under these circumstances favorable variations would tend to be preserved, and unfavorable ones to be destroyed. The result of this would be the formation of a new species."* (Darwin, 1859)

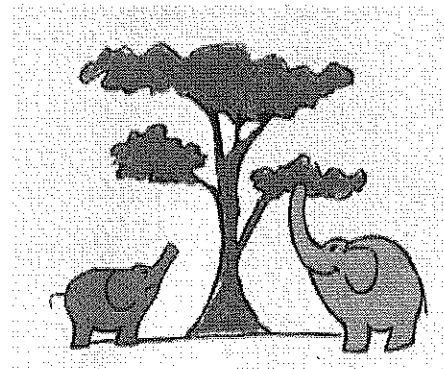


Fig. 4: An example of the struggle for existence. © CNDP, 2009

Moreover, Charles Darwin published an additional theory in his important publication 'On the origin of species' (1859): the theory of \_\_\_\_\_. It says that the change of species takes place in small steps (gradually) and not in saltations (leaps). **Darwin** deduced gradualism from an old tradition in Natural Philosophy, according to which there are generally no saltations (leaps) in nature.

However, also other researchers made contributions to the development of evolutionary theory, especially Henry W. Bates and Ernst Haeckel.

In 1862, **Henry W. Bates** observed in the Amazon region that edible butterflies imitate the coloration of poisonous or inedible butterflies, when both species occur in the same habitat. He termed this phenomenon \_\_\_\_\_. When the appearance of poisonous butterflies varied geographically, Bates discovered the same variations among edible butterflies. Mimicry means imitation.

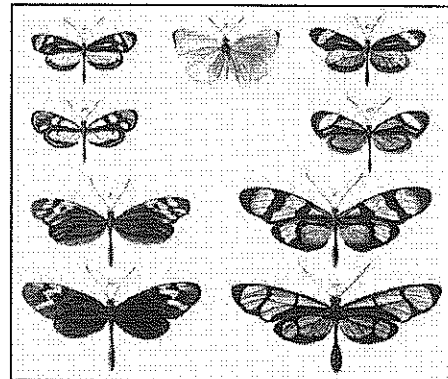


Fig. 5: A drawing from Henry W. Bates.  
(in: Linn. Soc. 23:495-566, 1862; Source: [www.wikipedia.org](http://www.wikipedia.org))

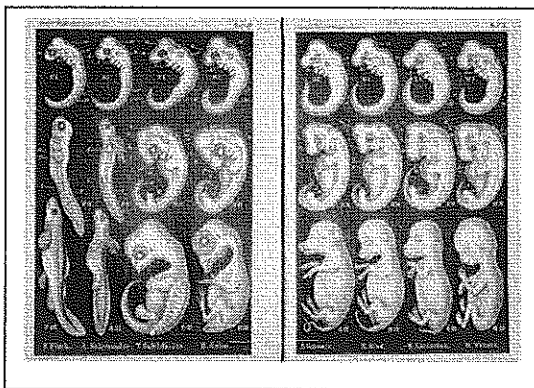


Fig. 6: Each column shows three embryonic steps of development of a species. Considering the first line reveals that the different species are very similar to each other in the beginning of the embryonic development.

(Haeckel, 1874; Source: [www.wikipedia.org](http://www.wikipedia.org))

In 1866, **Ernst Haeckel** described the \_\_\_\_\_:

*"During its rapid and short development, the organic individual repeats the most important modifications its ancestors had to pass through during their slow and long-lasting paleontological development according to the laws of inheritance and adaptation."*

Five years later **Charles Darwin** published a further theory. He developed the theory of \_\_\_\_\_,

with the intention to explain characteristics like the gorgeous tail of the peacock. At first sight it seems to be disadvantageous for the peacock, but it is favored by the peahens. The theory of natural selection was not a sufficient explanation for this phenomenon.

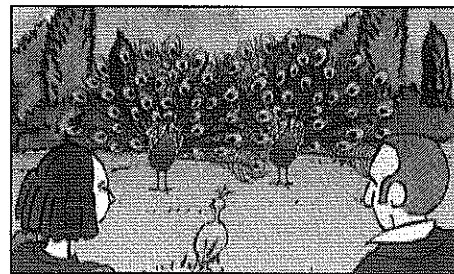


Fig. 7: Darwin assumed that females have apparently a sense of beauty. © CNBP, 2009

**Exercise 2 (expert group, teamwork)**

Check your cloze texts and your reading comprehension for correctness. Subsequently answer the following questions:

- a) Which term (that Darwin himself never used) is used for Darwin's first theory of 1837 as it is known today? You know this term from class.

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- b) Why do nonpoisonous butterflies imitate the coloration of poisonous butterflies? Why was Charles Darwin encouraged by these findings?

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- c) Why couldn't Charles Darwin explain the gorgeous tail of the peacock by natural selection? Find another explanation for the gorgeous tail of the peacock!

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- d) Give further examples for characteristics that developed by means of sexual selection.

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**Exercise 3 (expert group, individual work)**

Copy the terms you filled into the gaps of the cloze text (everything that is underlined) onto the 'milestone-cards' (see last page of the material). There is one card for each milestone from the period of Darwinism.

**Exercise 4 (home group, teamwork):**

Each of you is asked to present the milestones of his/her period to the other team members by attaching the milestone-cards chronologically to the time bar. The expert for the period of Darwinism starts. For each milestone-card, the expert explains, which person arrived at which insight by which means and how the insight changed evolutionary theory. Afterwards, the next expert follows until the time bar is completed.

**Exercise 5 (home group, teamwork):**

After completing the time bar, your team creates a concept map with as many connections as possible.

- 1.) Choose at least 12 milestones from the time bar (each period should be included).
- 2.) Write down the term from each milestone on a piece of paper.
- 3.) Arrange the pieces on a blank sheet so that the milestones which have a close connection lie close to each other. Consider what kind of relationship exists between the different milestones.

**The following advices may help you:**

The relation between two terms can be that ...

- ... one term is an example of the other term (i.e.: mimicry is an example of natural selection)
- ... one term is part of the other term in the sense of a whole – part relationship (i.e.: chromosomes contain genes)
- ... terms are superordinate or subordinate concepts (i.e. mutation and selection are evolutionary factors)

- 4.) If you are satisfied with the arrangement of the milestones and the relations between them, glue the pieces of paper on the blank sheet.
- 5.) Now draw arrows between the terms.
- 6.) Describe the relationship above the arrows.